WHAT IS CLAIMED IS:

1. A tunable wavelength optical filter, comprising:

a lower mirror in which silicon films and oxide films are sequentially laminated in a multi-layer and the silicon film is laminated on the top portion;

an upper mirror in which silicon films and oxide films are sequentially laminated in a multi-layer and the silicon film is laminated on the top portion and which is spaced away from said lower mirror by a predetermined distance;

a connecting means for connecting and supporting said lower mirror and said upper mirror to a semiconductor substrate; and

electrode pads for controlling the gap between said lower mirror and said upper mirror by an electrostatic force.

2. The tunable wavelength optical filter according to claim 1, wherein said lower mirror is composed of a first conductive silicon film/a first oxide film/a second silicon film/a second oxide film/a third conductive silicon film formed sequentially.

3. The tunable wavelength optical filter according to claim 1, wherein said lower mirror is composed of at least three layers in which the silicon film and the oxide film are sequentially formed and the conductive silicon film laminated on the top portion therein.

4. The tunable wavelength optical filter according to claim 1, wherein said upper mirror is composed of a first conductive silicon film/a first oxide

film/a second silicon film/a second oxide film/a third conductive silicon film formed sequentially.

5. The tunable wavelength optical filter according to claim 1, wherein said upper mirror is composed of at least three layers in which the silicon film and the oxide film are sequentially formed and a conductive silicon film is laminated on the top portion therein.

6. The tunable wavelength optical filter according to claim 1, wherein said silicon film is formed so as to have a thickness of $(2m+1)\ \lambda/4n$ (m=0, 1, 2, ···),

wherein λ is the wavelength of the light source, and n is the optical refractive index of the silicon film.

7. The tunable wavelength optical filter according to claim 1, wherein said oxide film is formed so as to have a thickness of $(2m+1)\lambda/4n$ (m=0, 1, 2, ···),

wherein λ is the wavelength of the light source, and n is the optical refractive index of the oxide film.

8. The tunable wavelength optical filter according to claim 1, wherein said connecting means is a torsion bar or a spring composed of a silicon film.

9. The tunable wavelength optical filter according to claim 1, wherein said lower mirror is floated on said semiconductor substrate by a

predetermined distance, and an opening is provided on the rear side of said semiconductor substrate corresponding to the lower mirror.

10. The tunable wavelength optical filter according to claim 1, wherein said lower mirror and said upper mirror are symmetrical to each other, and said lower mirror and said upper mirror have a circular plate shaped structure.

11. The tunable wavelength optical filter according to claim 1, wherein the region around said lower and upper mirrors is opened so as to expose said semiconductor substrate, such that said lower mirror and said upper mirror are suspended by said connecting means.

12. The tunable wavelength optical filter according to claim 1, wherein the region around said upper mirror is opened so as to expose the region around said lower mirror, such that said upper mirror is suspended by said connecting means.

13. A method of manufacturing a tunable wavelength optical filter, comprising the steps of:

(a) forming a first sacrificial oxide film for floating a lower mirror on a semiconductor substrate;

(b) sequentially laminating conductive silicon films and oxide films for defining a mirror region on said first sacrificial oxide film in a multi-layer

and laminating another conductive silicon film to form a lower mirror;

(c) forming a second sacrificial film on the resultant;

(d) sequentially laminating conductive silicon films and oxide films for defining the mirror region on said second sacrificial oxide film in a multi-layer and laminating another conductive silicon film to form an upper mirror;

(e) etching the rear side of said semiconductor substrate to form an opening for inserting an optical fiber thereinto;

(f) forming electrode pads for controlling the gap between said lower mirror and said upper mirror by an electrostatic force;

(g) etching the silicon film around said upper mirror in a dry etching method to expose said second sacrificial oxide film, such that said upper mirror is suspended by a connecting means; and

(h) forming an optical tuning space between said lower mirror and said upper mirror and etching said first sacrificial oxide film and said second sacrificial oxide film such that said lower mirror is floated on said semiconductor substrate.

14. The method of manufacturing the tunable wavelength optical filter according to claim 13, further comprising the step of forming a structure of lower mirror embedded type that only the upper mirror is suspended by the connecting means and the lower mirror is not floated on the semiconductor substrate, after the step (g) and before the step (h).

15. The method of manufacturing the tunable wavelength optical filter

according to claim 13, wherein said first and second sacrificial oxide films are etched by a wet etching method using a hydrogen fluoride solution or a gas phase etching method using anhydrous hydrogen fluoride which the etching speed is quicker than that of the silicon film.

16. The method of manufacturing the tunable wavelength optical filter according to claim 13, wherein said silicon film is formed so as to have a thickness of $(2m+1)\lambda /4n$ (m=0, 1, 2, ···),

wherein λ is the wavelength of the light source, and n is the optical refractive index of the silicon film.

17. The method of manufacturing the tunable wavelength optical filter according to claim 13, wherein said oxide film is formed so as to have a thickness of $(2m+1)\lambda /4n$ (m=0, 1, 2, ···),

wherein λ is the wavelength of the light source, and n is the optical refractive index of the oxide film.

18. The method of manufacturing the tunable wavelength optical filter according to claim 13, further comprising the step of forming thermal oxide films on the both sides of the semiconductor substrate, before forming said first sacrificial oxide film.

19. The method of manufacturing the tunable wavelength optical filter according to claim 13, wherein said the step (b) comprises the steps of:

depositing a first conductive silicon film on said first sacrificial oxide

film,

depositing a first oxide film on said first silicon film and patterning the first oxide film to define the mirror region;

depositing a second silicon film on said first silicon film and said patterned first oxide film;

depositing a second oxide film on said second silicon film and patterning the second oxide film to define the mirror region; and

forming a third conductive silicon film on said second silicon film and said patterned second oxide film.

20. The method of manufacturing the tunable wavelength optical filter according to claim 13, wherein said the step (d) comprises the steps of:

depositing a first conductive silicon film on said second sacrificial oxide film,

depositing a first oxide film on said first silicon film and patterning the first oxide film to define the mirror region;

depositing a second silicon film on said first silicon film and said patterned first oxide film;

depositing a second oxide film on said second silicon film and patterning the second oxide film to define the mirror region; and

forming a third conductive silicon film on said second silicon film and said patterned second oxide film.

21. A method of manufacturing a tunable wavelength optical filter,

comprising the steps of:

(a) forming a sacrificial oxide film for floating a mirror on a semiconductor substrate;

(b) sequentially laminating conductive silicon films and oxide films for defining a mirror region on said sacrificial oxide film in a multi-layer and laminating another conductive silicon film to form a mirror;

(c) etching the rear side of said semiconductor substrate to form an opening for inserting an optical fiber thereinto;

(d) forming electrode pads for controlling the gap between the mirrors by an electrostatic force;

(e) etching the silicon film around said mirror in a dry etching method to expose said sacrificial oxide film, such that said mirror is suspended by a connecting means; and

(f) etching said sacrificial oxide film such that said mirror is floated on said semiconductor substrate.

wherein two semiconductor substrate formed by said steps (a) to (f) are prepared and are attached to each other through a spacer layer therebetween so that the mirrors of said semiconductor substrates are opposite to each other.

22. The method of manufacturing the tunable wavelength optical filter according to claim 21, wherein said sacrificial oxide film is etched by a wet etching method using a hydrogen fluoride solution or a gas phase etching method using anhydrous hydrogen fluoride which the etching speed of the

sacrificial oxide film is quicker than that of the silicon film.

23. The method of manufacturing the tunable wavelength optical filter according to claim 21, wherein said silicon film is formed so as to have a thickness of $(2m+1)\lambda /4n$ (m=0, 1, 2, ···),

wherein λ is the wavelength of the light source, and n is the optical refractive index of the silicon film.

24. The method of manufacturing the tunable wavelength optical filter according to claim 21, wherein said oxide film is formed so as to have a thickness of $(2m+1)\lambda /4n$ (m=0, 1, 2, ···),

wherein λ is the wavelength of the light source, and n is the optical refractive index of the oxide film.

25. The method of manufacturing the tunable wavelength optical filter according to claim 21, further comprising the step of forming thermal oxide films on the both sides of the semiconductor substrate, before forming said sacrificial oxide film.

26. The method of manufacturing the tunable wavelength optical filter according to claim 21, said the step (b) comprises the steps of:

depositing a first conductive silicon film on said sacrificial oxide film,

depositing a first oxide film on said first silicon film and patterning the first oxide film to define a mirror region;

depositing a second silicon film on said first silicon film and said patterned first oxide film;

depositing a second oxide film on said second silicon film and patterning the second oxide film to define the mirror region;

forming a third conductive silicon film on said second silicon film and said patterned second oxide film.